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APPENDIXES

APPENDIX A

Questionnaire

Please kindly answer the questions by marking (/) one box or more which are the nearest of your opinion, and fill in the blanks for any reasons. This questionnaire shall be a part of the research in the topic of "Passively Integrated Design Strategies in Thermal Comfort of Industrial Buildings in Tropical Climate".

Part I: Personal Information/ Background

1. Gender: ☐ Male
   ☐ Female
2. Age: ☐ Less than 25 years
   ☐ 26~35 years
   ☐ 36~45 years
   ☐ 46~55 years
   ☐ More than 55 years
3. Position: ☐ Temporary employee
   ☐ Permanent employee
   ☐ Chief/ Supervisor
   ☐ Manager/ Director
   ☐ President / Vice president
   ☐ Others_____
4. Job description _____
5. Number of employees in your company:
   5.1 Total ☐ Less than 250 persons
   ☐ 251~500 persons
   ☐ 501~750persons
   ☐ 751~1,000 persons
   ☐ More than 1,000 persons
   5.2 In your working building, number of employees_____persons.

Part II: Energy Saving Method/ Awareness

1. Do you know about 'global warming' condition?
   ☐ Yes, ☐ I know a little bit.
   ☐ I am very interested in this matter.
   ☐ No.
   If yes, please explain_____
2. Which conditions are important for effective working in your opinion? Please rank in priority.
   ___ Suitable temperature for working
   ___ Suitable lighting for working
   ___ Suitable noise for working
   ___ Suitable humidity in working area
   ___ Suitable air velocity for working area
   ___ Convenient tools for doing your work
   ___ Safety procedure in your work

___ Others_____

3. How could you reduce the energy consumption for the company?
   - ☐ Turn off lighting when not in use.
   - ☐ Turn off air-condition when not in use.
   - ☐ Use adequate water in toilet.
   - ☐ Reuse copied paper on the other side in office.
   - ☐ Others_____
4. Please arrange the priority of design strategies of energy saving for the company in your opinion?
   - ___ Locate building in good orientation of the direction of wind and sun.
   - ___ Recycle waste materials into production process
   - ___ Reduce solar reflectance by providing lawn or trees to cover the soil.
   - ___ Use building enveloped materials to protect solar heat gain.
   - ___ Reduce lighting usage by providing daylight from skylight and high window.
   - ___ Provide opening wall or roof monitor for good natural ventilation.
   - ___ Green roof concept (by lawn or plant)
   - ___ Use fluorescent tubes for lighting fixture.
   - ___ No idea
5. Which conditions of space do you wish to improve for your better work? Please rank in priority.
   - ___ Size of working space ☐ should be increased ☐ should be reduced
   - ___ Lighting of working space ☐ should be increased ☐ should be reduced
   - ___ Volume of working space ☐ should be increased ☐ should be reduced
   - ___ Ventilation of working space ☐ should be increased ☐ should be reduced
   - ___ Sound absorption of roof from noisy rain
   - ___ Indoor air quality (odor, toxic gas, dust, etc.) of working space
   - ___ Others _____

6. Do you think the innovative devices (for example, solar cell or double glazing) can be helpful for saving energy in terms of building design?
   - ☐ Yes, because_____
   - ☐ No, because _____
7. Do you think good environment (aesthetic, optimal temperature, optimal lighting, optimal noise, etc.) can be encouraged you to make more productivity?
   - ☐ Yes, because_____
   - ☐ No, because _____
8. Do you think space or workplace in your company is related to your activities of work?
   - ☐ Yes, because_____
   - ☐ No, because _____

Part III: Constructed Material of Building/ Performance

1. Which type of ventilation is using in your manufacturing area?
   - ☐ Natural ventilation
   - ☐ Fan assistant
   - ☐ Air condition
   - ☐ Others_____

2. Please specify the roof finish

   _____

   Color _____
3. Please specify the ceiling finish

   _____

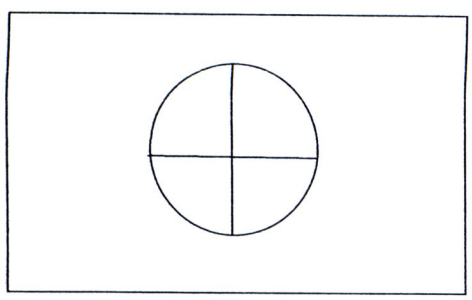
   Color _____
4. Please specify the exterior wall finish

   _____

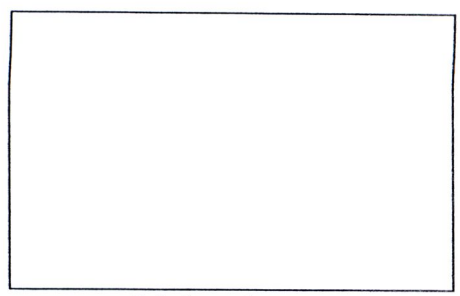
   Color _____
5. Please specify the floor finish

   _____

   Color _____
6. Building size _____
7. Building orientation and job location in your building



Orientation



Job location

8. Others _____

Part IV: Energy Saving Management/ Policy (for managerial staffs)

1. What is your company's operated in hour per day?
   ☐ 8:00~17:00 (8 hours) ☐ 8:00~21:00 (12 hours) ☐ 8:00~8:00 (24 hours)
2. Which design strategies do you use in management for saving the energy in your building?
   ☐ Skylight ☐ Roof monitor ☐ Auto-lighting
   ☐ Natural ventilation ☐ Fan assistant ☐ Photovoltaic (PV)
   ☐ Insulation ☐ Shading devices ☐ Glazing system
   ☐ Others _____
3. What is the most important factor in consideration to select your site location?
   ☐ Infra structure (for example; electricity, plumbing, public transportation, etc.)
   ☐ Avoid flooding area
   ☐ Supporting from government
   ☐ Functional zoning followed regulation
   ☐ Neighborhood land condition
   ☐ Others _____
4. How do you manipulate the water usage? (answer can be more than 1 choice)
   ☐ Use rainwater harvesting system
   ☐ Use waste water treatment system

- ☐ Reuse grey water from waste water treatment
- ☐ Discharge to public drainage directly
- ☐ Others_____

5. Which criteria of construction materials do you consider to use for friendly environment? (please rank in priority)
   - ___ Durability
   - ___ Energy saving
   - ___ Maintenance
   - ___ Transportation
   - ___ Recycle products
   - ___ Non-toxic products
   - ___ Innovative products
   - ___ Others_____
6. In your opinion, which design principle is the most effectiveness in energy saving in your building?
   - ☐ Using effective lighting design
   - ☐ Using daylighting in design
   - ☐ Using shading to protect solar heat gain from outside
   - ☐ Using insulation to protect heat transfer into building
   - ☐ Using insulation to control noise level
   - ☐ Using window to wall ratio less than 30%
   - ☐ Using stack ventilation driven by natural wind
   - ☐ Using fan assisted ventilation
   - ☐ Using wind turbine to generate electric power
   - ☐ Using photovoltaic (PV) to generate electric power
   - ☐ Others_____

APPENDIX B

Climatological Data for the Period 1971 -2007

Index : 48455 (Station : 455201-BANGKOK METROPOLIS)

Latitude : 13.43.35 N Longitude : 100.33.36 E Elevation above MSL : 3.01 Meters

Elements		N-Years	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Pressure (hPa)	Mean	37	1012.4	1011.3	1010	1008.5	1007.2	1006.6	1006.7	1006.9	1008.1	1009.9	1011.6	1013	1009.35
	Mean Daily Range	37	4.71	4.73	4.79	4.79	4.34	3.74	3.68	3.91	4.47	4.54	4.45	4.61	4.4
	Ext.Max.	36	1023.1	1021.3	1024.3	1017.1	1014.1	1013	1013.3	1013.2	1018.6	1018.6	1020.4	1023.3	1024.3
	Ext.Min.	36	1008.9	1009.5	1007.1	1010	1010	1010	1010	1010	1005.3	1007.5	1008.5	1010.5	1005.3
Temperature (Celcius)	Mean Max.	37	32.3	33	34.1	35.2	34.4	33.5	33.1	32.8	32.6	32.5	32.2	31.6	33.1
	Ext. Max.	37	37.6	37	38.1	40	39.5	37.7	37.8	37	37.2	36.2	37.5	36.7	40
	Mean Min.	37	22.1	24	25.5	26.6	26.1	25.9	25.5	25.3	24.9	24.6	23.5	21.6	24.6
	Ext.Min.	37	22.6	24.4	24.6	26.7	25.2	25.1	24.9	24.9	24.2	24.6	23	20.6	20.6
Dew Point Temp. (Celcius)	Mean	37	20.1	22.2	23.6	24.6	24.6	24.2	23.9	23.7	24.1	23.7	21.4	19	22.9
Relative Humidity (%)	Mean	37	70	73	74	73	75	76	76	76	80	79	71	67	74
	Mean Max.	37	87	89	88	87	89	88	89	89	92	92	86	83	88
	Mean Min.	37	49	52	54	54	59	60	60	61	63	62	54	50	57
	Ext. Min.	37	46	52	50	52	54	60	59	56	66	58	56	99	46
Visibility (Km.)	07.00 LST	37	6	6	7	8	9	10	10	10	9	8	9	8	8
Cloud Amount (1-10)	Mean	37	6	6	7	7	8	8	9	9	9	8	7	6	7
Wind (Knots)	Prev. Wind	37													
	Mean	37	2.2	3.6	4.4	3.9	3.2	3.4	3.3	3.3	2.2	1.8	2.2	2.2	3
	Max.	37	25	32	34	45	38	38	40	42	36	42	30	28	45
Pan Evaporation (mm.)	Mean	37	131	139	176	179	166	147	146	146	124	120	123	130	144
Rainfall (mm)	Mean	37	9.8	21.2	37.8	71.9	220.8	153.7	161.3	204.9	334.2	267.3	48.4	6.8	128.2
	Mean Rainy Day	37	2	2	3	6	16	16	17	19	21	17	6	1	11
	Daily Max.	37	43.1	55.4	88.4	93.5	248.6	167.3	108.6	128.9	156.7	143.9	116.6	32	248.6
Phenomena (Days)	Fog	37	2	1	0	0	0	0	0	0	0	0	0	0	0
	Haze	37	23	17	17	12	5	2	2	1	2	5	10	18	9
	Hail	37	0	0	0	0	0	1	0	0	0	0	0	0	0
	Thunder Storm	37	0	1	2	5	13	10	10	10	16	13	3	0	7
	Squall	37	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX C

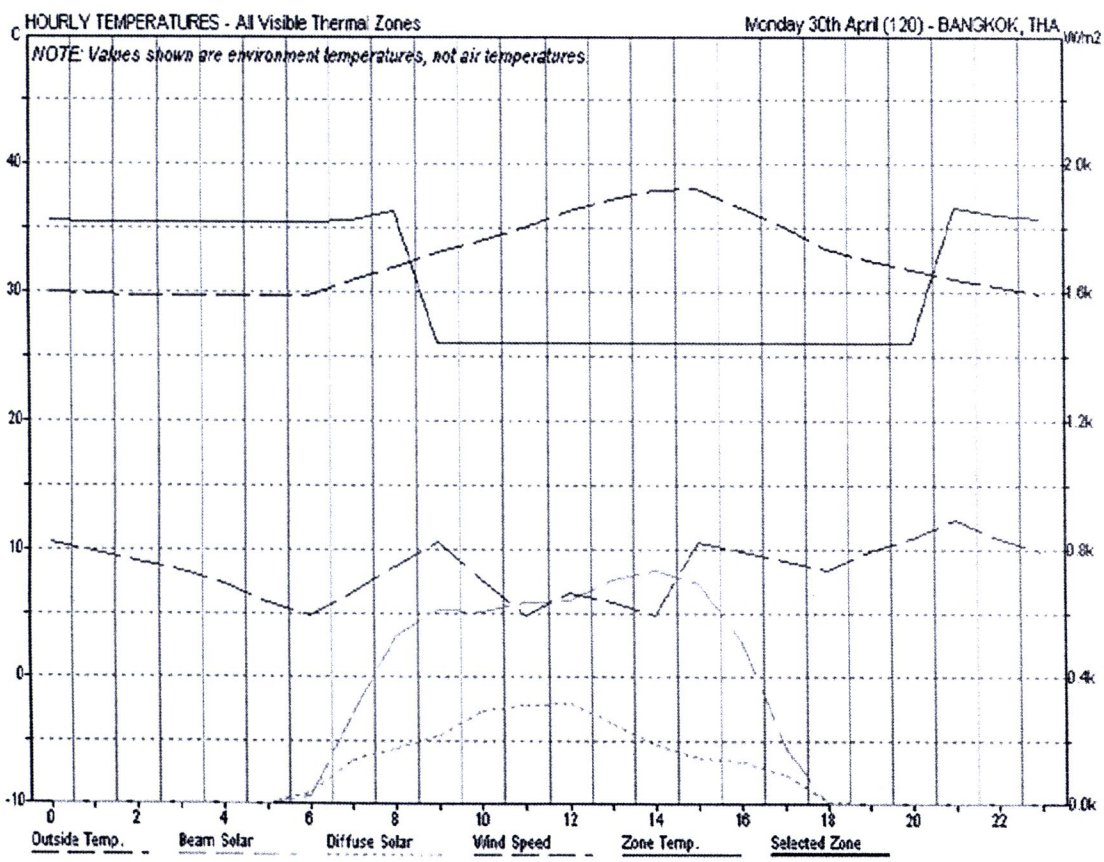
Thermal Calculation Data

HOURLY TEMPERATURES - Monday 29th April (120)

All Visible Thermal Zones
Total Surface Area: 8345.820 m^2 (165.6% flr area).
Total Exposed Area: 4608.832 m^2 (91.4% flr area).
Total South Window: 0.000 m2 (0.0% flr area).
Total Window Area: 0.000 m^2 (0.0% flr area).
Total Conductance (AU): 14511 W/°K
Total Admittance (AY): 43449 W/°K

Select a zone to display internal temperatures.

Conventional case

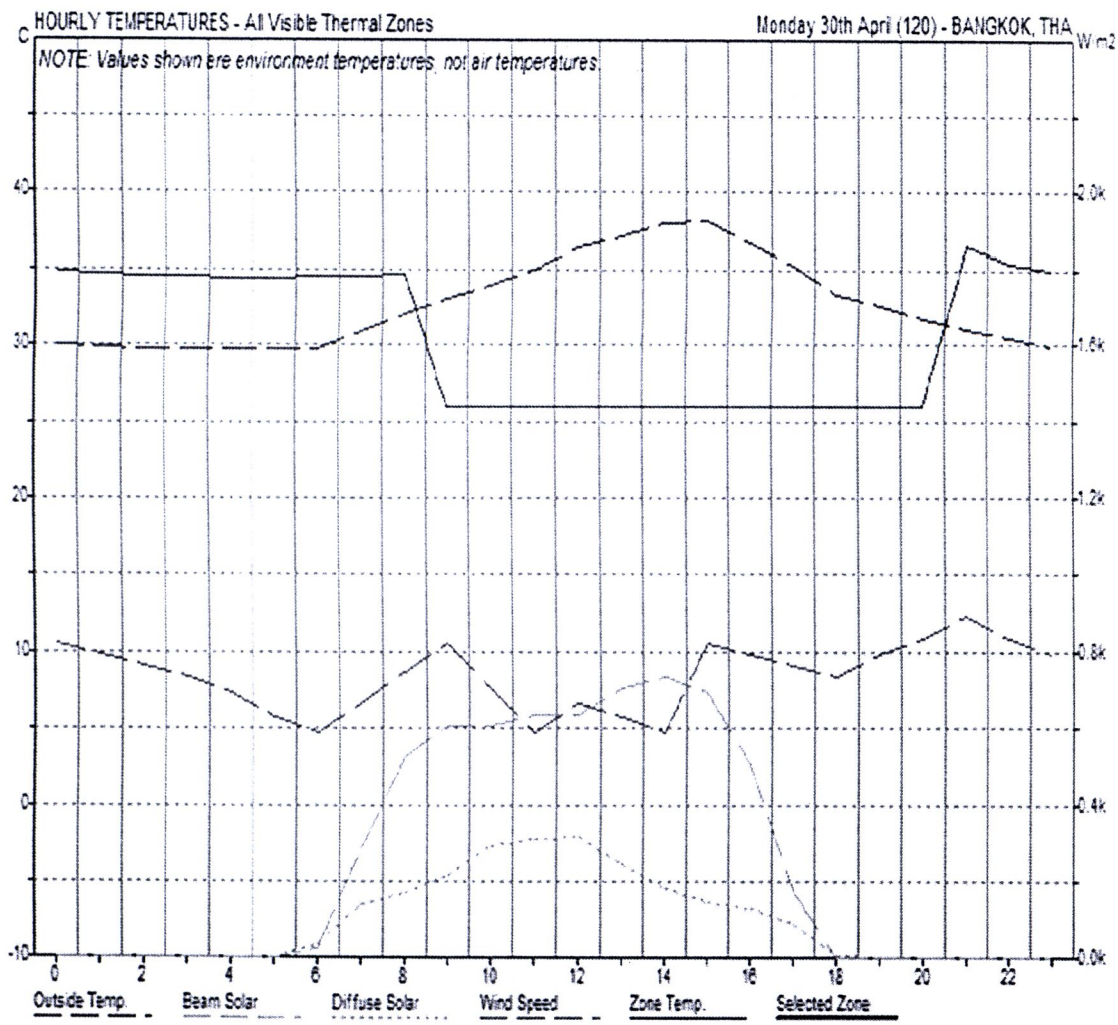


HOURLY TEMPERATURES - Monday 29th April (120)

All Visible Thermal Zones
Total Surface Area: 8345.221 m^2 (165.6% flr area).
Total Exposed Area: 6048.530 m^2 (120.0% flr area).
Total South Window: 106.884 m^2 (2.1% flr area).
Total Window Area: 106.884 m^2 (2.1% flr area).
Total Conductance (AU): 11021 W/°K
Total Admittance (AY): 39045 W/°K

Select a zone to display internal temperatures.

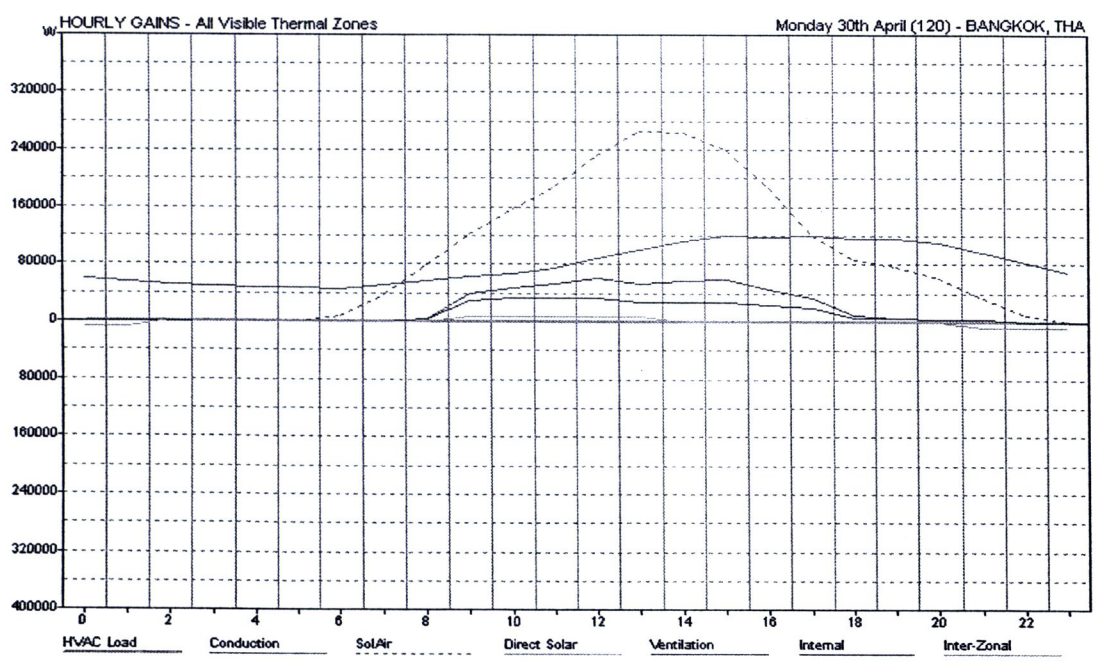
Integrated case



HOURLY GAINS - Monday 29th April (120)
Conventional case

Zone: All Visible Thermal Zones

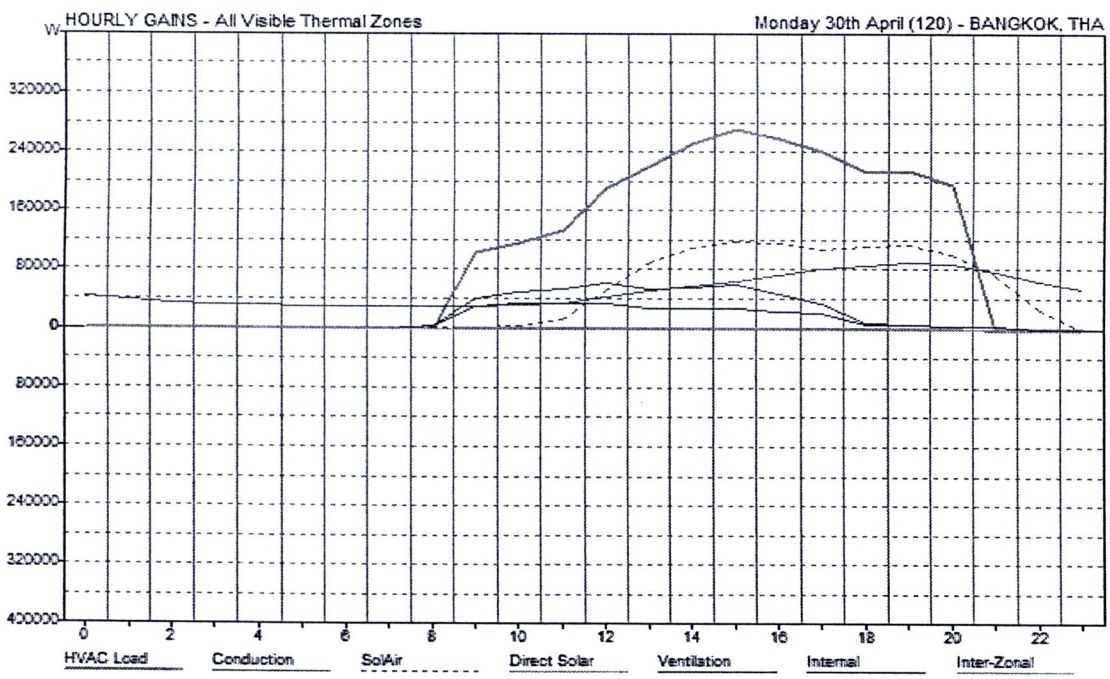
HOUR	HVAC (Wh)	FABRIC (Wh)	SOLAR (Wh)	VENT. (Wh)	INTERN (Wh)	ZONAL (Wh)
0	0	59894	0	0	0	-7389
1	0	54185	0	0	0	-7290
2	0	50762	0	0	0	989
3	0	48460	0	0	0	585
4	0	46839	0	0	0	374
5	0	46678	0	0	0	217
6	0	53051	0	0	0	102
7	0	87658	0	0	0	-125
8	0	135318	0	3626	3360	-717
9	0	183825	0	39174	30240	7158
10	0	225047	0	47907	33600	7155
11	0	262879	0	52556	33600	7172
12	0	321654	0	61742	33600	7340
13	0	365555	0	52813	26880	7891
14	0	375395	0	56060	26880	4
15	0	359148	0	59834	26880	4
16	0	304878	0	45668	23520	4
17	0	238990	0	33469	20160	4
18	0	201808	0	8923	6720	4
19	0	192461	0	6036	5040	4
20	0	170739	0	3567	3360	4
21	0	130093	0	3169	3360	-8233
22	0	92156	0	0	0	-7787
23	0	69235	0	0	0	-7548
TOTAL	**0**	**4076709**	**0**	**474545**	**277200**	**-81**



HOURLY GAINS - Monday 29th April (120)
Integrated case

Zone: All Visible Thermal Zones

HOUR	HVAC (Wh)	FABRIC (Wh)	SOLAR (Wh)	VENT. (Wh)	INTERN (Wh)	ZONAL (Wh)
0	0	42719	0	0	0	-1782
1	0	37309	0	0	0	-1744
2	0	34392	0	0	0	-1447
3	0	32464	0	0	0	-1464
4	0	30776	0	0	0	-1461
5	0	30151	0	0	0	-1464
6	0	29485	0	0	0	-1474
7	0	29002	0	0	0	-1513
8	0	29471	0	3626	3360	-1545
9	101918	31659	0	39174	30240	844
10	116524	34173	0	47907	33600	844
11	132001	45000	0	52556	33600	845
12	189894	93704	0	61742	33600	848
13	220535	139992	0	52813	26880	851
14	251079	167518	0	56060	26880	621
15	269660	182325	0	59834	26880	621
16	257815	188006	0	45668	23520	621
17	240481	186230	0	33469	20160	621
18	212304	196040	0	8923	6720	621
19	214407	202710	0	6036	5040	621
20	196141	188594	0	3567	3360	621
21	0	147636	0	3169	3360	-2264
22	0	90811	0	0	0	-1946
23	0	53283	0	0	0	-1854
TOTAL	**2402760**	**2243450**	**0**	**474545**	**277200**	**-11378**

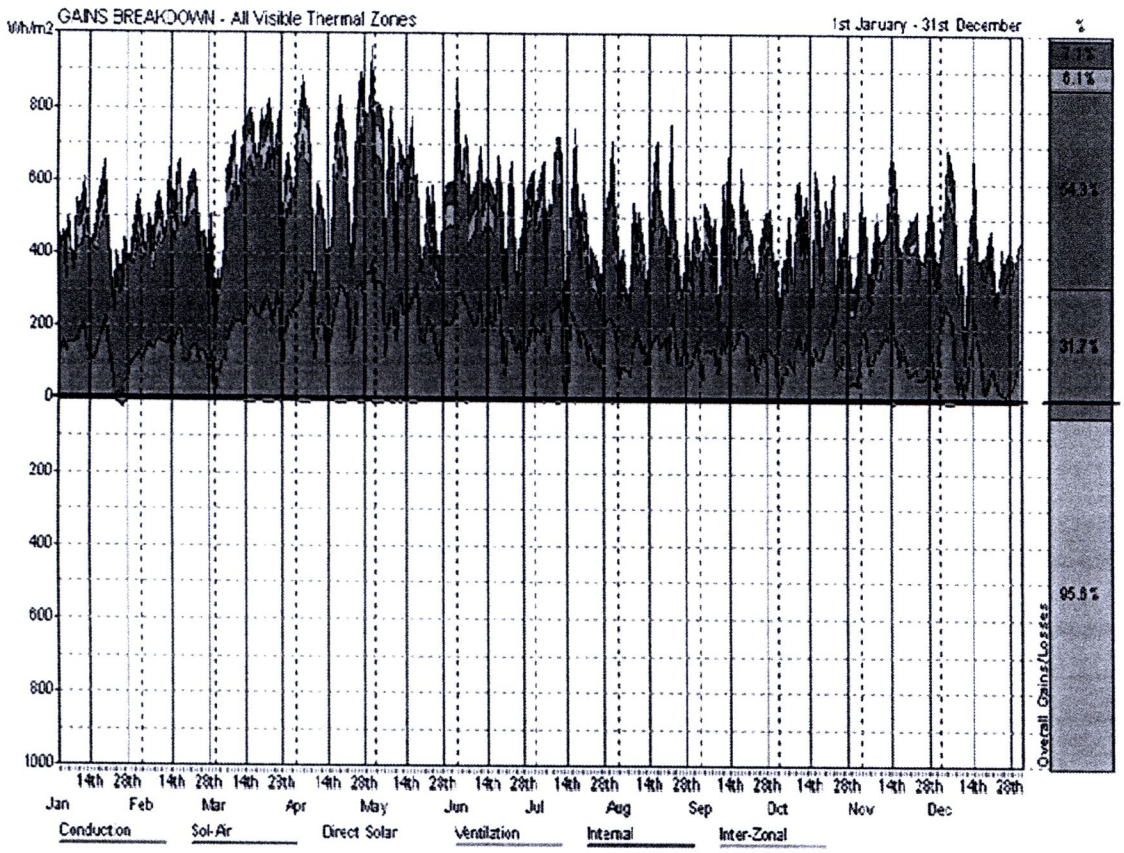


GAINS BREAKDOWN - All Visible Thermal Zones

FROM: 1st January to 31st December

Conventional Case

CATEGORY	LOSSES	GAINS
FABRIC	4.40%	31.70%
SOL-AIR	0.00%	54.30%
SOLAR	0.00%	0.00%
VENTILATION	0.00%	6.10%
INTERNAL	0.00%	7.10%
INTER-ZONAL	95.60%	0.70%

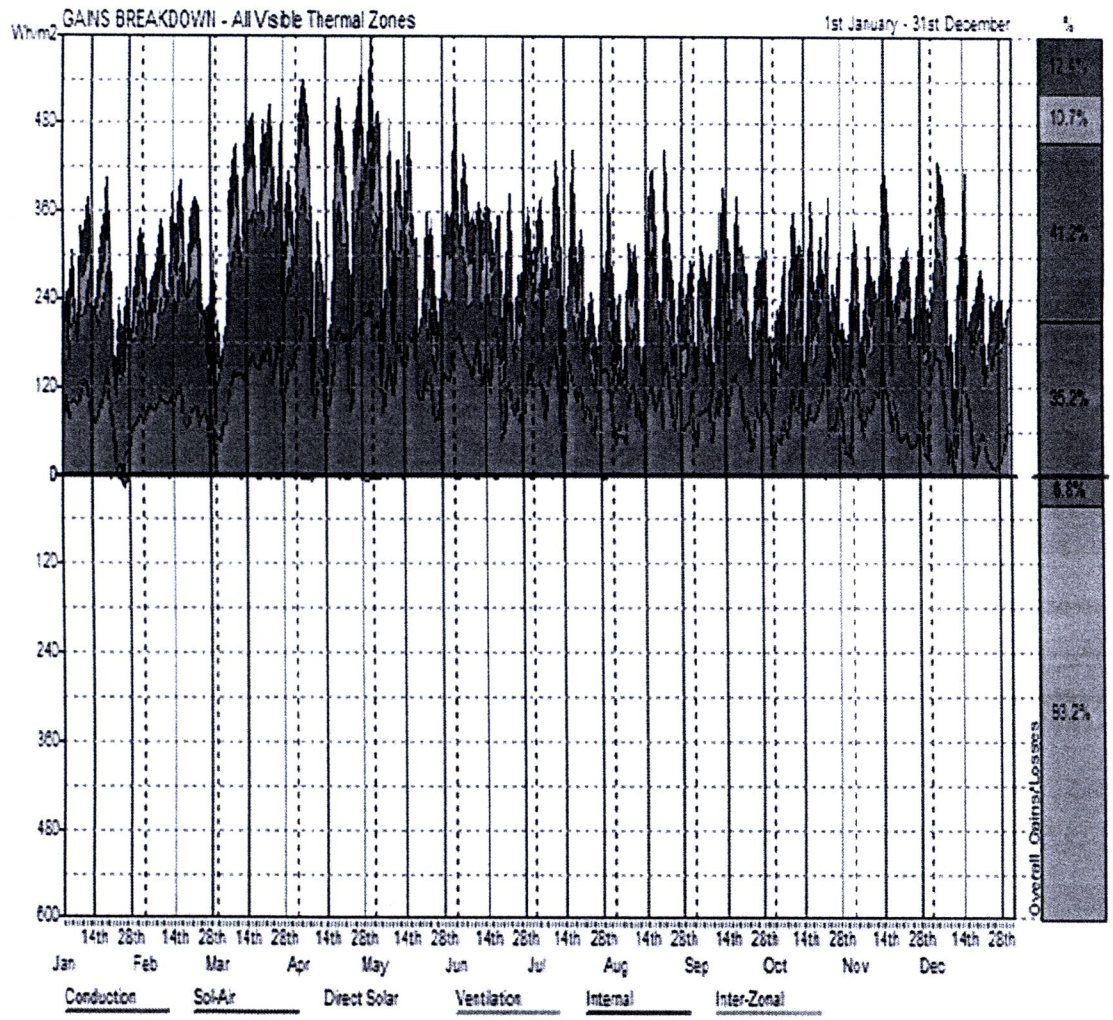


GAINS BREAKDOWN - All Visible Thermal Zones

FROM: 1st January to 31st December

Integrated Case

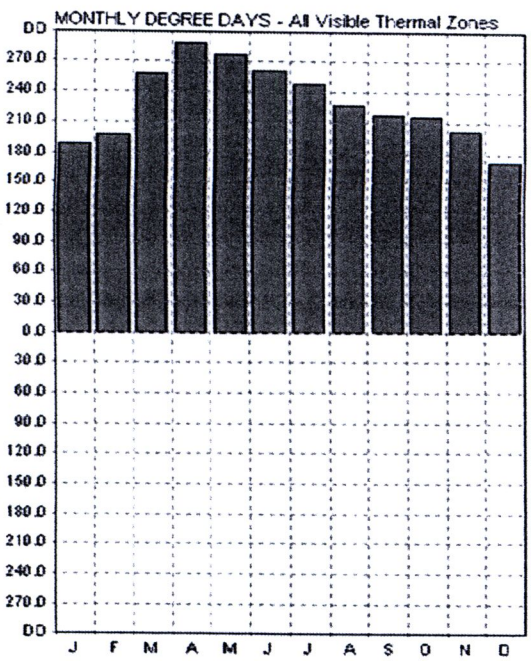
CATEGORY	LOSSES	GAINS
FABRIC	6.80%	35.20%
SOL-AIR	0.00%	41.20%
SOLAR	0.00%	0.00%
VENTILATION	0.00%	10.70%
INTERNAL	0.00%	12.40%
INTER-ZONAL	93.20%	0.40%

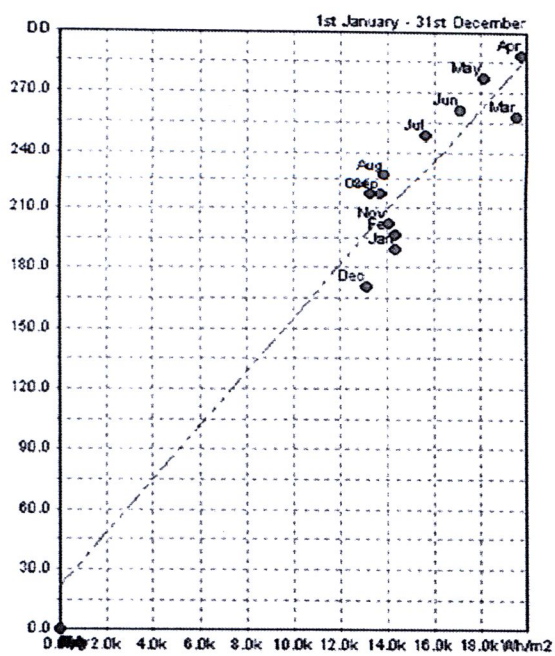


MONTHLY DEGREE DAYS - All Visible Thermal Zones

Conventional Case

MONTH	HEATDD (dd)	COOLDD (dd)	LOSSES (Wh)	GAINS (Wh)
Jan	0	188.7	23	14375
Feb	0	196.2	0	14407
Mar	0	257.9	2	19497
Apr	0	288.3	0	19762
May	0	277.3	0	18111
Jun	0	261.1	0	17106
Jul	0	248.7	1	15642
Aug	0	227.4	4	13858
Sep	0	217.2	7	13735
Oct	0	216.9	4	13286
Nov	0	202	5	14088
Dec	0	170.8	4	13141

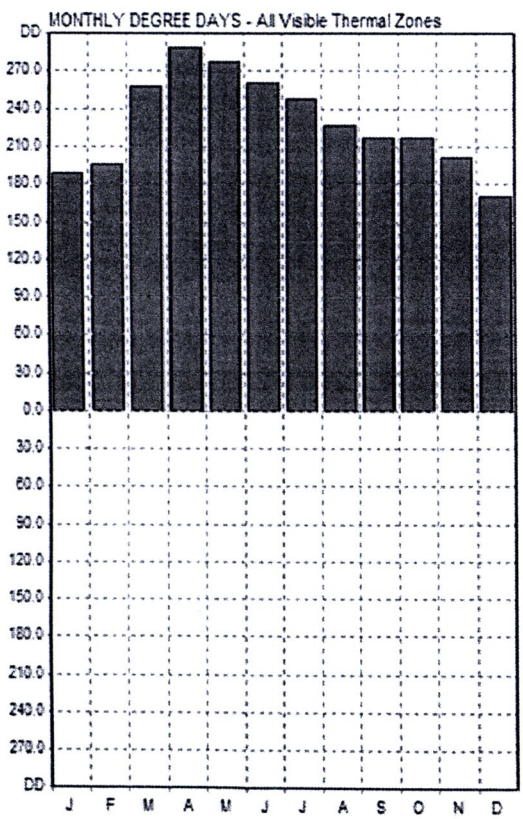


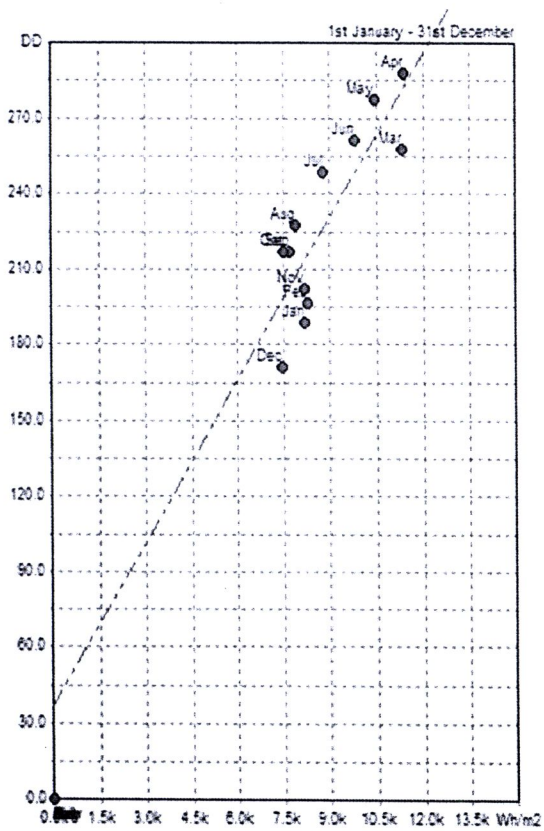


MONTHLY DEGREE DAYS - All Visible Thermal Zones

Integrated Case

MONTH	HEATDD (dd)	COOLDD (dd)	LOSSES (Wh)	GAINS (Wh)
Jan	0	188.7	4	8208
Feb	0	196.2	1	8309
Mar	0	257.9	1	11359
Apr	0	288.3	0	11391
May	0	277.3	1	10445
Jun	0	261.1	0	9811
Jul	0	248.7	0	8804
Aug	0	227.4	1	7886
Sep	0	217.2	1	7711
Oct	0	216.9	1	7485
Nov	0	202	0	8181
Dec	0	170.8	0	7463



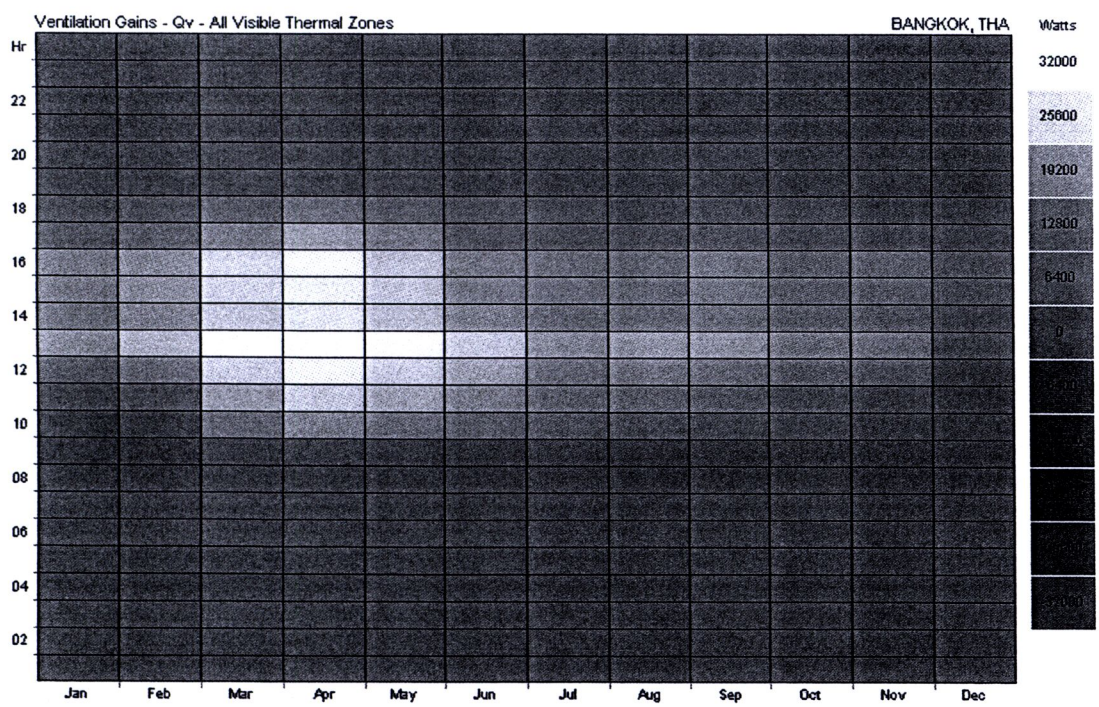


ANNUAL LOADS TABLE

Ventilation Gains - Qv

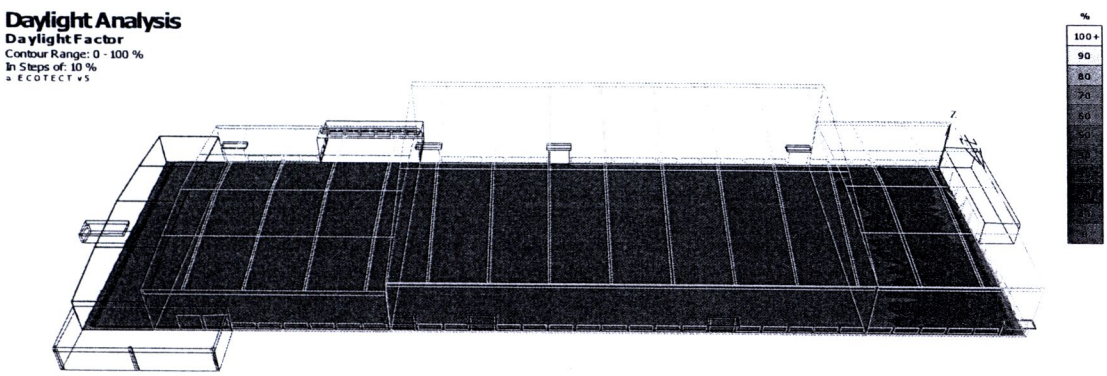
All Visible Thermal Zones - Monthly Averages

HOUR	JAN (Wh)	FEB (Wh)	MAR (Wh)	APR (Wh)	MAY (Wh)	JUN (Wh)	JUL (Wh)	AUG (Wh)	SEP (Wh)	OCT (Wh)	NOV (Wh)	DEC (Wh)
0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	218	394	1060	1605	1399	1358	1059	1133	826	750	533	222
9	5362	8452	16439	20155	18336	16989	14286	14368	11950	10302	8923	3656
10	10212	14047	21927	25355	23448	21036	17854	18240	16172	14139	12743	5612
11	14911	18955	25587	28407	26196	23415	19280	20480	19056	16938	15838	7627
12	20659	24034	29670	31577	29009	25836	21582	22621	21952	19788	19092	11065
13	17334	19906	23982	26332	23854	20023	17202	17548	17881	15342	15575	10171
14	18141	20200	24498	27390	24299	19305	17241	16914	18217	15129	15798	11456
15	18940	20258	24952	28179	24727	18635	17223	16223	18544	14893	15957	12702
16	13694	15021	18163	21685	18929	14222	12795	11409	13119	10925	11560	8784
17	9361	10437	12439	15992	13969	10338	9025	7371	8495	7604	7928	5624
18	2376	2574	3139	4479	3904	2857	2360	1770	2123	2048	1927	1305
19	1424	1535	2043	2961	2550	1865	1566	1063	1299	1298	1137	783
20	719	774	1148	1727	1458	1080	881	534	671	704	576	429
21	495	513	936	1486	1254	902	760	452	514	578	413	346
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0



APPENDIX D
Experimental Data Analysis
Daylighing Data Analysis

CONVENTIONAL CASE



Report: Grid Analysis

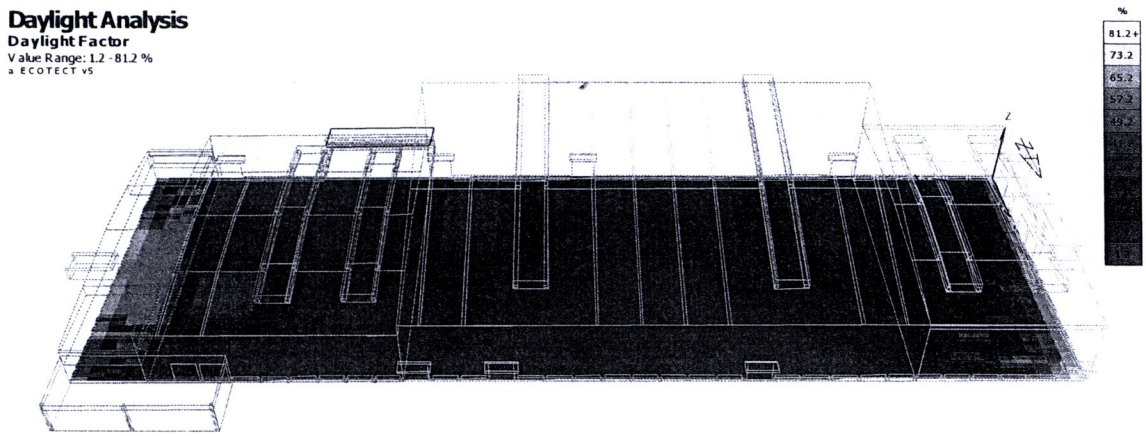
Description: Percentage of nodes by contour band.

Model: K:\Revision of Thesis\Simulation-Final revised\Base case.eco

Daylight Factor

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
0-10	3411	83.28	4096	100
10-20	441	10.77	685	16.72
20-30	0	0	244	5.96
30-40	0	0	244	5.96
40-50	2	0.05	244	5.96
50-60	45	1.1	242	5.91
60-70	60	1.46	197	4.81
70-80	136	3.32	137	3.34
80-90	1	0.02	1	0.02
90-100	0	0	0	0

INTEGRATED CASE



Report: Grid Analysis

Description: Percentage of nodes by contour band.

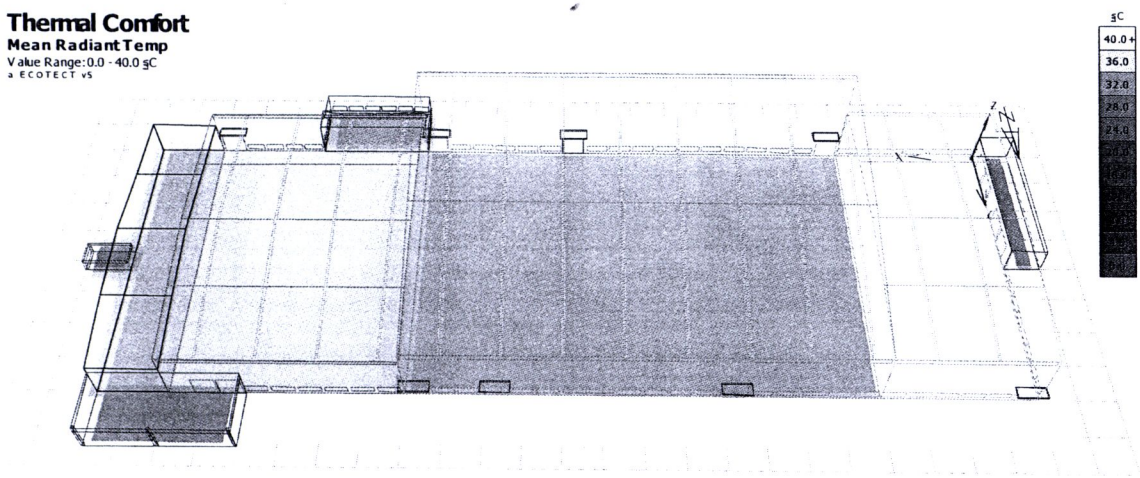
Model: K:\Revision of Thesis\Simulation-Final revised\Case4-Integrated case.eco

Daylight Factor

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
1.2-9.2	1924	46.97	4096	100
9.2-17.2	890	21.73	2172	53.03
17.2-25.2	470	11.47	1282	31.3
25.2-33.2	342	8.35	812	19.82
33.2-41.2	33	0.81	470	11.47
41.2-49.2	0	0	437	10.67
49.2-57.2	177	4.32	437	10.67
57.2-65.2	60	1.46	260	6.35
65.2-73.2	21	0.51	200	4.88
73.2-81.2	127	3.1	179	4.37

MRT Data Analysis

BASE CASE (CONVENTIONAL CASE)



Average Value: 40.85 ⁵C
Above Clip Threshold: 100.0%
Visible Nodes: 4096

Report: Grid Analysis

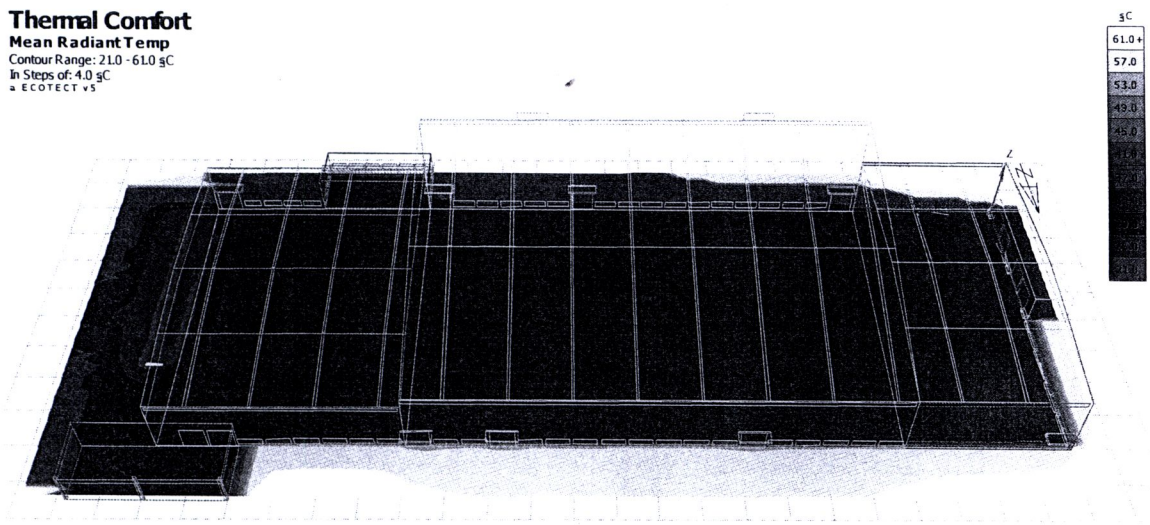
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\\Base case.eco

Mean Radiant Temp

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
0-4	0	0	4096	100
4-8	0	0	4096	100
8-12	0	0	4096	100
12-16	0	0	4096	100
16-20	0	0	4096	100
20-24	0	0	4096	100
24-28	0	0	4096	100
28-32	151	3.69	4096	100
32-36	1970	48.1	3945	96.31
36-40	571	13.94	1975	48.22

CASE-1 (OPENING DESIGN)



Report: Grid Analysis

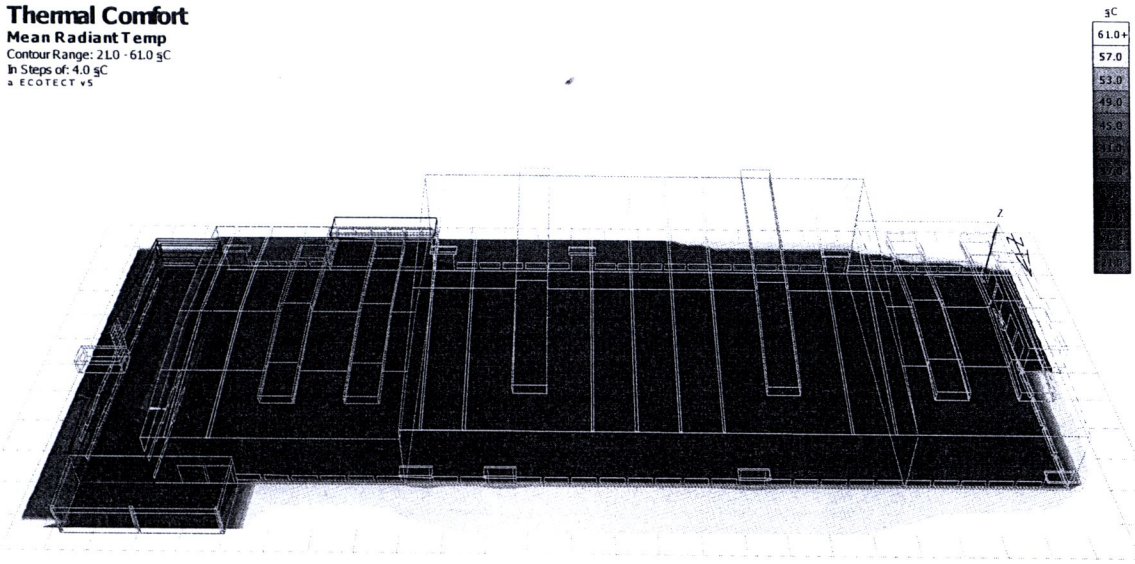
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Case1-Opening design.eco

Mean Radiant Temp

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
21-25	62	1.51	4094	99.95
25-29	92	2.25	4032	98.44
29-33	104	2.54	3940	96.19
33-37	2749	67.11	3836	93.65
37-41	428	10.45	1087	26.54
41-45	19	0.46	659	16.09
45-49	0	0	640	15.62
49-53	0	0	640	15.62
53-57	32	0.78	640	15.62
57-61	410	10.01	608	14.84

CASE-2 (ROOF MONITOR)



Report: Grid Analysis

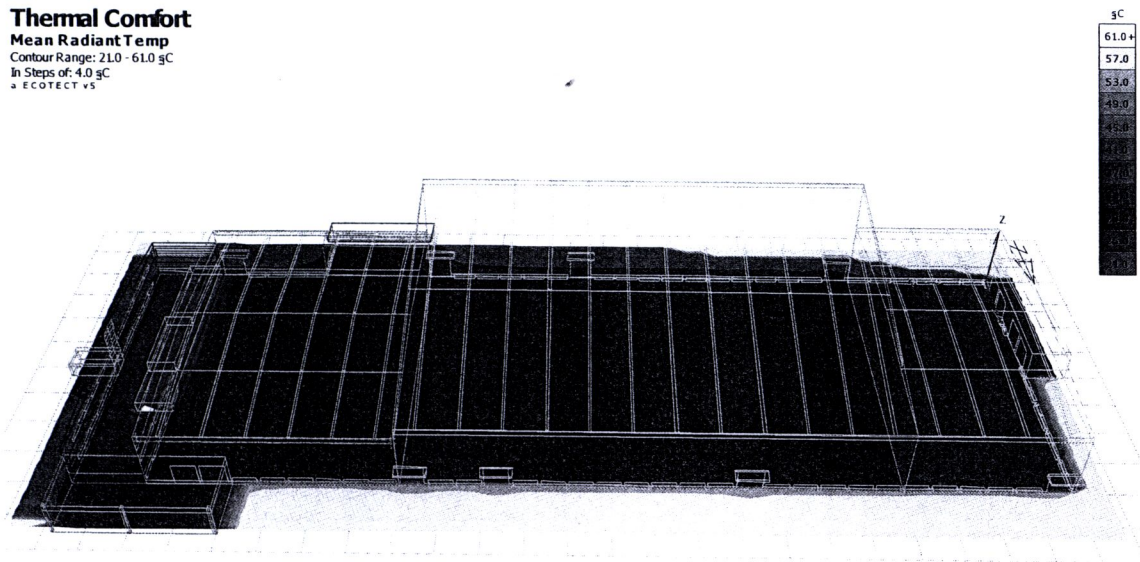
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Case2-Roof monitor.eco

Mean Radiant Temp

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
21-25	53	1.29	4094	99.95
25-29	97	2.37	4041	98.66
29-33	110	2.69	3944	96.29
33-37	2743	66.97	3834	93.6
37-41	433	10.57	1091	26.64
41-45	19	0.46	658	16.06
45-49	0	0	639	15.6
49-53	0	0	639	15.6
53-57	31	0.76	639	15.6
57-61	412	10.06	608	14.84

CASE-3 (ROOF INSULATION)



Report: Grid Analysis

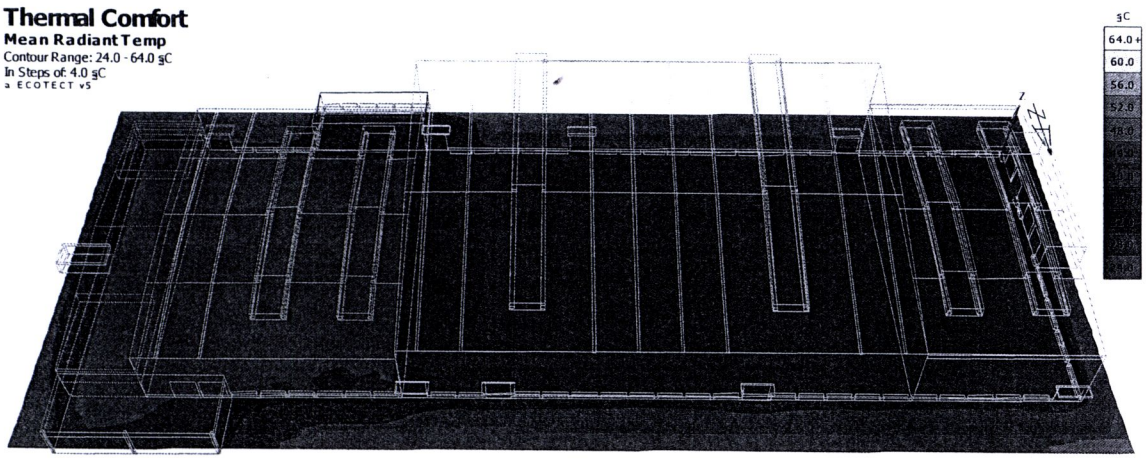
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Case3-Roof insulation.eco

Mean Radiant Temp

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
21-25	67	1.64	4093	99.93
25-29	130	3.17	4026	98.29
29-33	2202	53.76	3896	95.12
33-37	701	17.11	1694	41.36
37-41	354	8.64	993	24.24
41-45	0	0	639	15.6
45-49	0	0	639	15.6
49-53	0	0	639	15.6
53-57	59	1.44	639	15.6
57-61	580	14.16	580	14.16

CASE-4 (INTEGRATED CASE)



Report: Grid Analysis

Description: Percentage of nodes by contour band.

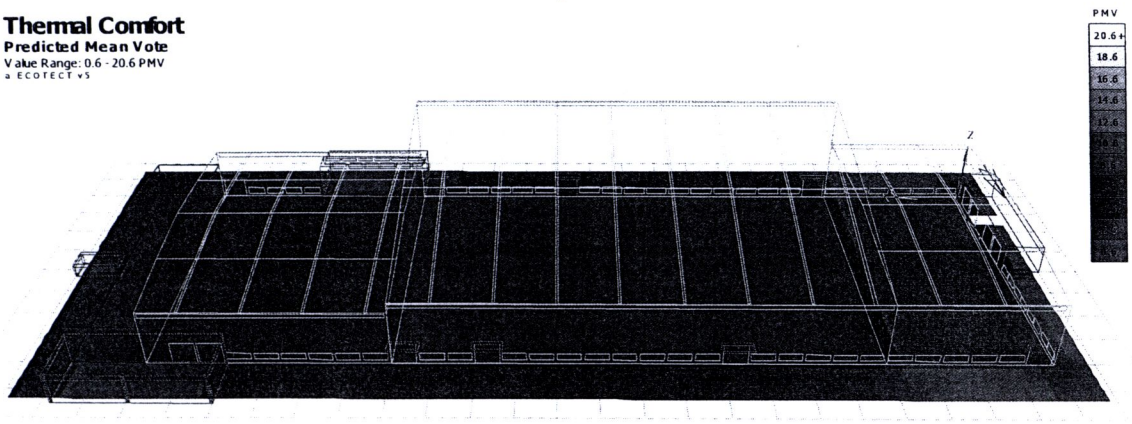
Model: K:\Kmutt-Thesis\Simulation\Final revised\Case4-Integrated case-final.eco

Mean Radiant Temp

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
24-28	869	21.22	4096	100
28-32	2052	50.1	3227	78.78
32-36	69	1.68	1175	28.69
36-40	263	6.42	1106	27
40-44	459	11.21	843	20.58
44-48	368	8.98	384	9.38
48-52	16	0.39	16	0.39
52-56	0	0	0	0
56-60	0	0	0	0
60-64	0	0	0	0

PMV Data Analysis

BASE CASE (CONVENTIONAL CASE)



Report: Grid Analysis

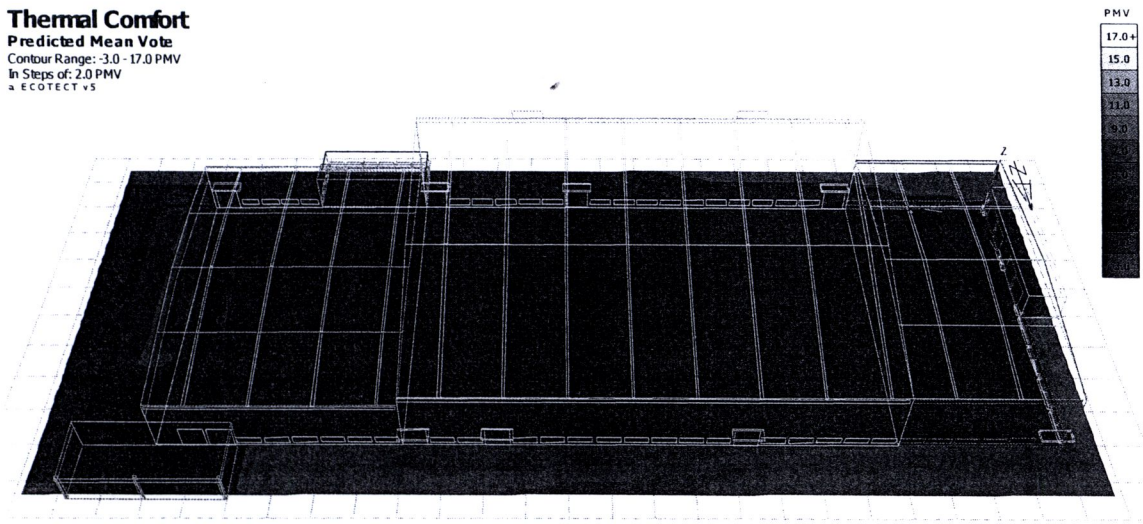
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Base case.eco

Predicted Mean Vote

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
0.6-2.6	1634	39.89	4094	99.95
2.6-4.6	1379	33.67	2460	60.06
4.6-6.6	197	4.81	1081	26.39
6.6-8.6	667	16.28	884	21.58
8.6-10.6	131	3.2	217	5.3
10.6-12.6	86	2.1	86	2.1
12.6-14.6	0	0	0	0
14.6-16.6	0	0	0	0
16.6-18.6	0	0	0	0
18.6-20.6	0	0	0	0

CASE-1 (OPENING DESIGN)



Report: Grid Analysis

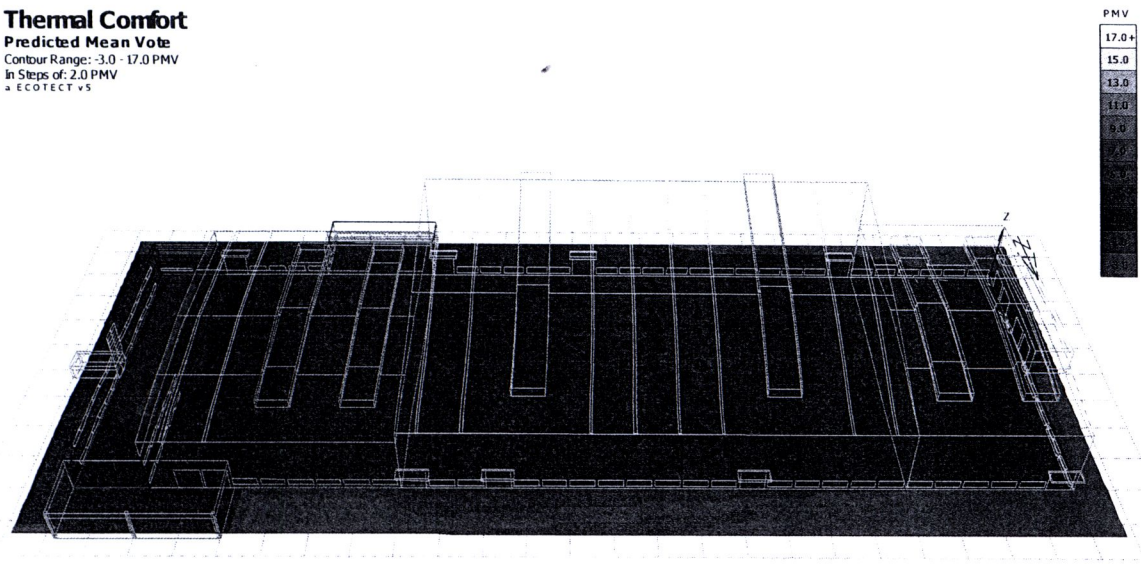
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Case1-Opening design.eco

Predicted Mean Vote

Contour Band	Within		Above	
(from-to)	Pts	(%)	Pts	(%)
-3--1	45	1.1	4096	100
-1-1	124	3.03	4051	98.9
1-3	162	3.96	3927	95.87
3-5	3125	76.29	3765	91.92
5-7	195	4.76	640	15.62
7-9	445	10.86	445	10.86
9-11	0	0	0	0
11-13	0	0	0	0
13-15	0	0	0	0
15-17	0	0	0	0

CASE-2 (ROOF MONITOR)



Report: Grid Analysis

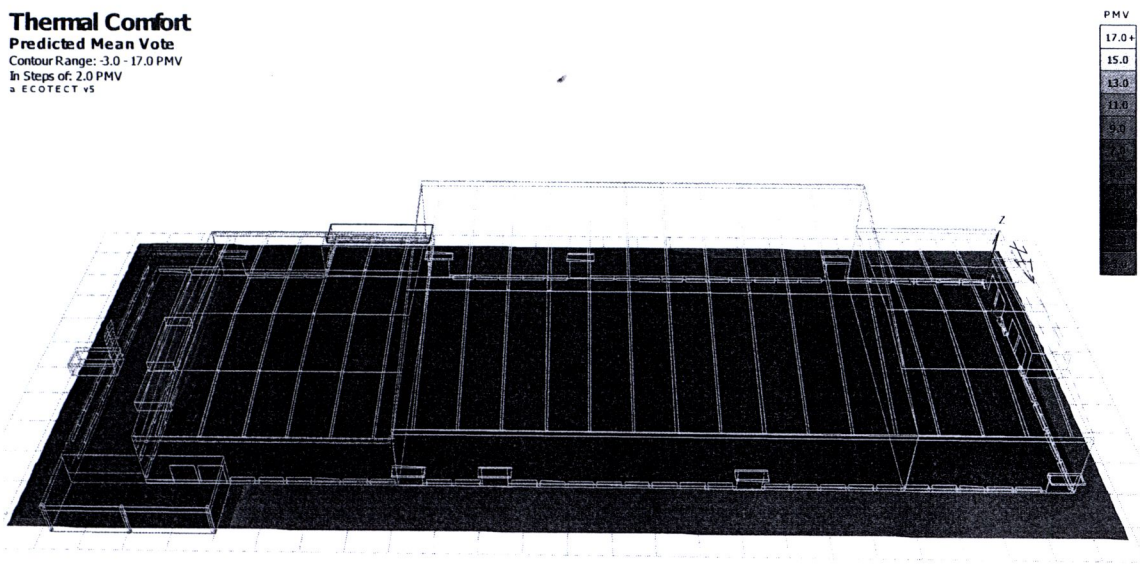
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Case2-Roof monitor.eco

Predicted Mean Vote

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
-3--1	44	1.07	4096	100
-1-1	123	3	4052	98.93
1-3	335	8.18	3929	95.92
3-5	2955	72.14	3594	87.74
5-7	199	4.86	639	15.6
7-9	440	10.74	440	10.74
9-11	0	0	0	0
11-13	0	0	0	0
13-15	0	0	0	0
15-17	0	0	0	0

CASE-3 (ROOF INSULATION)



Report: Grid Analysis

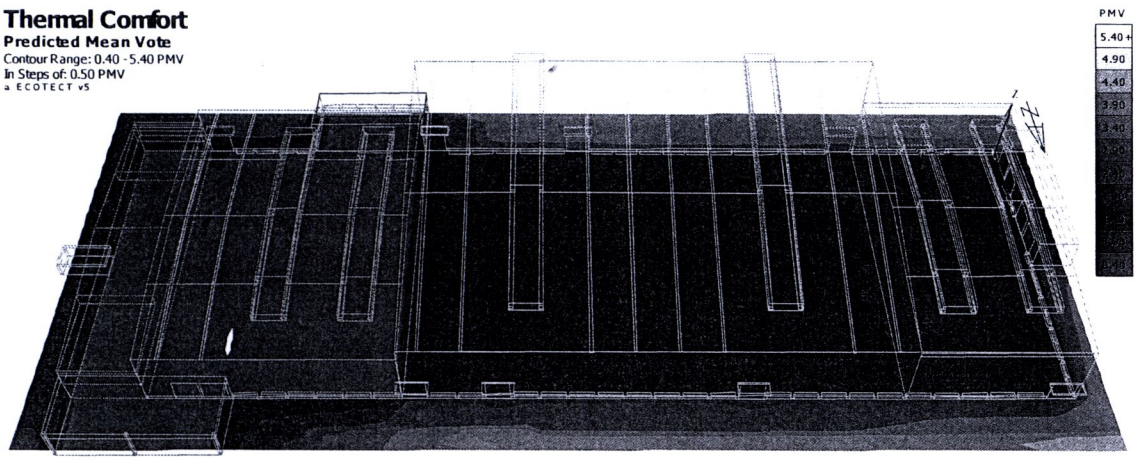
Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Case3-Roof insulation.eco

Mean Radiant Temp

Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
21-25	67	1.64	4093	99.93
25-29	130	3.17	4026	98.29
29-33	2202	53.76	3896	95.12
33-37	701	17.11	1694	41.36
37-41	354	8.64	993	24.24
41-45	0	0	639	15.6
45-49	0	0	639	15.6
49-53	0	0	639	15.6
53-57	59	1.44	639	15.6
57-61	580	14.16	580	14.16

CASE-4 (INTEGRATED CASE)



Average Value: 1.88 PMV
Above Clip Threshold: 99.9%
Visible Nodes: 4096

Report: Grid Analysis

Description: Percentage of nodes by contour band.

Model: K:\Kmutt-Thesis\Simulation\Final revised\Case4-Integrated case.eco

Predicted Mean Vote Contour Band (from-to)	Within Pts	(%)	Above Pts	(%)
0.4-0.9	1001	24.44	4092	99.9
0.9-1.4	48	1.17	3091	75.46
1.4-1.9	1452	35.45	3043	74.29
1.9-2.4	737	17.99	1591	38.84
2.4-2.9	122	2.98	854	20.85
2.9-3.4	240	5.86	732	17.87
3.4-3.9	291	7.1	492	12.01
3.9-4.4	181	4.42	201	4.91
4.4-4.9	20	0.49	20	0.49
4.9-5.4	0	0	0	0

BIOGRAPHY

Name	Mr. Prasitchai Promliphonkul
Place of Birth	Udonthani, Thailand
Date of Birth	22 November 1967
Educational Record	High School Bodin Decha (Singh Singhaseni), 1986 Bachelor of Architecture (Architecture) Faculty of Architecture Chulalongkorn University, 1991 Master of Architecture (Design and Planning) School of Architecture and Design King Mongkut's University of Technology Thonburi, 2011
Scholarships	King Mongkut's Brilliant Student Scholarship 2008 Energy Policy and Planning Office (EPPO) Fund 2009
Employment Record	Architect AEP International Ltd. during 1991-1992 Architect Architectural Design Department Thai Takenaka International Ltd. during 1992-2004 Section Manager Architectural Design Department Thai Takenaka International Ltd. during 2004-Present
Publication	Promliphonkul P., Chutarat A., PH.D., 2010, "Passively Integrated Design Strategies in Thermal Comfort of Industrial Buildings in Tropical Climate", **The 4th SEATUC SYMPOSIUM** [2010, February 25-26], Tokyo, Japan

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Home address: **931/188** Building: **Baan Sathorn Chaopraya**
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